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2. That the translator responsible for the attached translation is well acquainted with the German and English languages.

3. That the attached is, to the best of RWS Group plc knowledge and belief, a true translation into the English language of the accompanying copy of the specification filed with the application for a patent in Germany on 18 February 1999 under the number 199 06 828.3 and the official certificate attached hereto.

4. That I believe that all statements made herein of my own knowledge are true and that all statements made on information and belief are true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application in the United States of America or any patent issuing thereon.

For and on behalf of RWS Group plc

The 18th day of June 2003

FEDERAL REPUBLIC OF GERMANY

[Eagle crest]

Priority Certificate
for the filing of a Patent Application

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Applicant/Proprietor: Ticona GmbH, Kelsterbach/DE

Title: Polyester molding composition and its use for laser welding

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The attached documents are a correct and accurate reproduction of the original submission for this Application.

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TICONA GmbH 1999/G002 Dr.ZI/HO

Polyester molding composition and its use for laser welding

The invention relates to a molding composition made from polyester with color pigments and its use for bonding thermoplastics with the aid of laser welding.

Laser welding of thermoplastics has not yet become widely established in industry, since high capital expenditure deters potential users. However, H. Potente et al. in Plastverarbeiter No. 46 (1995), pp. 42 - 46, describes the enormous advantages of this process in various applications. In particular a considerable potential market is forecast for the jointing process in the future (see Plastverarbeiter No. 48 (1997) pp. 28 - 30).

In laser welding two plastics are normally combined with one another by bonding an upper plastic translucent to laser light with a lower plastic not translucent to laser light. The laser beam here passes through the upper layer of plastic leaving it unchanged and encounters the lower layer, by which it is absorbed with liberation of thermal energy. The thermal energy liberated melts the plastics material and thus bonds it to the upper layer at the point of impact of the laser beam.

A disadvantage of this method, however, is that it is not possible to process black-pigmented plastics compositions, since the carbon black used for the black coloration always immediately absorbs the laser light, with the result that no bond is produced.

The object of the present invention was to provide a polyester molding composition with black coloration which is translucent to laser light and which therefore is suitable for bonding by the laser welding method to other black plastics parts.

This object has been achieved by a molding composition of the type mentioned at the outset, whose characterizing feature can be seen in the fact that it comprises a pigment combination of yellow pigment and violet pigment.

According to the invention the polyester materials used comprise thermoplastic polyesters which contain polymerized units deriving from an ester of at least one aromatic dicarboxylic acid, in particular from terephthalic acid, isophthalic acid or 2,6-naphthalenedicarboxylic acid and from at least one aliphatic diol, in particular ethylene glycol 1,3-propanediol or 1,4-butanediol, or which contain polymerized units of tetrahydrofuran. Examples of suitable polyesters according to the invention are described in Ullmann's Encyclopedia of Ind. Chem., ed. Barbara Elvers, Vol. A24, Polyester section (pp. 227 - 251) VCH Weinheim-Basel-Cambridge-New-York (1992). According to the invention particular preference is given to polyesters such as polyethylene terephthalate or polybutylene terephthalate and to copolyesters containing butylene terephthalate units and butylene isophthalate units.

The polyesters may also have been modified by incorporating, during the condensation, small amounts of aliphatic dicarboxylic acids, such as glutaric acid, adipic acid or sebacic acid, or of polyglycols, such as diethylene glycol or triethylene glycol, or else higher-molecular-weight polyethylene glycols. The polyesters may also contain other polymerized units derived from hydroxycarboxylic acids, preferably from hydroxybenzoic acid or from hydroxynaphthalenecarboxylic acid.

Besides freshly prepared polyester the polyesters may also comprise first-, second- or higher-generation recycled materials, or mixtures of freshly prepared polyester with recycled materials. Mixtures of this type may also, if desired, comprise additives, or may have been modified by admixing other compatible polymers.

For the purposes of the invention, yellow pigment is in particular Sandoplast Yellow, a pigment deriving from the chinophthalone group of dyes. Sandoplast Yellow - 2 G is indicated in the color index under "S.V. 114 = Solvent Yellow 114".

For the purposes of the invention, violet pigment is in particular Sandoplast Violet, a pigment deriving from the anthrachinone group of dyes. Sandoplast Violet - RSB is indicated in the color index under "S.V. 13 = S lvent Violet 13".

Sandoplast dyes of this type are generally high-quality polymer-soluble dyes which are suitable for coloring a variety of plastics. They are standardized in polystyrene, in which they give a brilliant and transparent coloration. Opaque formulations can be achieved by adding white pigments, such as titanium dioxide or zinc sulfide. Combinations with other organic or inorganic pigments give more intensely colored and more brilliant colorations. Sandoplast dyes can be used together with fluorescent Hostasol dyes to achieve especially brilliant hues.

The amount of yellow pigment suitable according to the invention is from 0.1 to 2 g, preferably from 0.5 to 1.5 g, per kg of plastic.

The amount of violet pigment suitable according to the invention is from 2 to 10 g, preferably from 3 to 8 g, per kg of plastic.

Surprisingly, it has been found that the molding composition with the pigment combination according to the invention, although it looks black to the naked eye, is completely translucent to laser light and is therefore highly suitable for producing the upper translucent layer for the laser welding process.

The working example below is intended to give the skilled worker a more detailed description of the invention and the advantages achievable therewith.

Example 1 (Comparative test)

Two black films made from polybutylene terephthalate with an added amount of 6.5 g of carbon black per kg of plastic were produced by extrusion and had in each case a thickness of 40 μm. The two films were laid one on top of the other and irradiated with a laser beam from a NdYAG laser for a period of 3 s.

After the irradiation the surface of the upper film had melted, but there had been no bonding of the two films.

Example 2 (inventive)

Example 1 was repeated except that the upper film used a polybutylene terephthalate with a pigment combination of black appearance, made from 0.9 g of Sandoplast Yellow and 5.1 g Sandoplast Violet per kg of plastic.

After the same period of irradiation as in Example 1, using an identical laser beam, a firmly adhering bond had developed between the two films.

Patent Claims

1. A molding composition made from polyester with color pigments, which comprises a pigment combination of yellow pigment and violet pigment.

2. A molding composition as claimed in claim 1, in which the polyesters present are thermoplastic polyesters, such as polyethylene terephthalate or polybutylene terephthalate or copolyesters having units derived from butylene terephthalate units and butylene isophthalate units.

3. A molding composition as claimed in claim 1 or 2, in which the yellow pigment present comprises Sandoplast Yellow.

4. A molding composition as claimed in claim 3, which comprises an amount of from 0.1 to 2 g, preferably from 0.5 to 1.5 g, of yellow pigment per kg of plastic.

5. A molding composition as claimed in claim 1 or 2, in which the violet pigment present comprises Sandoplast Violet.

6. A molding composition as claimed in claim 5, which comprises an amount of from 2 to 10 g, preferably from 3 to 8 g, of violet pigment per kg of plastic.

7. The use of a molding composition as claimed in any one of claims 1 to 6 for producing the upper translucent layer for bonding plastics by the laser welding method.

TIC 1999/G 002

TICONA GmbH

Abstract

The invention relates to a polyester molding composition having a pigment combination of Sandoplast yellow and Sandoplast violet, and its use for laser welding.

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